The use of multiple reflecting angled paths in the manner claimed ensures that at least some of the light provided to the detector is off-axis light. This allows imaging infrared reflectance spectrometers according to the invention to create higher-quality images by eliminating or reducing the amount of specularly reflected infrared light that reaches the detector from the surface of the sample. This type of reflected light is undesirable in chemical imaging experiments because it does not include any chemical imaging information. It can therefore interfere with the detection of diffusely reflected light, which contains chemical information resulting from its interaction with chemical components of the sample. The claimed approach can thus provide significant improvements in dynamic range over prior art infrared imaging systems, which have generally employed through-the-lens single-source illumination systems.

The claimed approach can also improve the quality of infrared chemical images by preventing shadows from being created on the sample. This allows better spectral and spatial information about the sample to be provided to a two-dimensional infrared image detector. It can also allow more of the areas of even the most irregularly shaped sample to be uniformly illuminated with infrared light. The result is a two-dimensional chemical image that does not exhibit darker and lighter areas, but instead shows a uniform picture of the chemical properties of a surface.

Rejection under 35 USC § 103

Claim 1 stands rejected as obvious over Kley et al. in view of Erickson and Malin et al.. Kley et al. disclose a non-invasive technique for measuring blood analyte concentration in mammals. In this technique, electromagnetic energy from a light source is passed through the tissue being sampled (typically the ear lobe or finger) to one or more detectors (col. 4, lines 21-24, col. 8, lines 65-67). A combination of sources are said to be used to provide a broad spectral response (col. 6, lines 53-55).

Malin et al. disclose another analyte measurement method that can be used in the determination of blood analyte concentrations (e.g., glucose, urea, lipids, bilirubin and alcohol). This system collects and filters spectrally modified radiation from a radiation source 52, and passes it on to detectors. The detectors are arranged so that each wavelength is detected by a single, discrete detector (col. 11, line 21- col. 12, line 9).

Erickson presents instruments with an array of light-emitting diodes or lasers that shine light through a turbid sample at particular discrete wavelengths (col. 1, line 34). These instruments each include a collimator or modulator array (14, 28) that discriminates against off-axis light (col. 8, lines 48-49). Erickson states that this selection of on-axis light is "necessary" (col.11, lines 39-41). Erickson also repeatedly indicates that his invention offers the prospect of affordable and compact implementations, such as portable or desktop units (col. 20, lines 18-26, col. 20, line 59-66), and points out that "any single scalar quantity such as a blood glucose measurement could probably be more economically and accurately determined by an implantable sensor designed for that specific purpose" (col. 1, line 66-col. 2, line 11).

The rejection acknowledges that none of the references teaches the invention by itself, but goes on to argue that one of ordinary skill in the art would have found it obvious to combine the references for the two following reasons:

1) to take advantage of time multiplexing of the acquisition of data, since no rastering is required, and multiple data at multiple data at multiple locations are acquired at the same time (this effectively reduces the amount of time required to obtain thousands of data points at multiple locations on a sample) (Office Action, page 6); and

2) to expand the range of uses for the apparatus and method to include more translucent tissues, as well as skin, muscle, bone, cartilage and other anatomical features that are reflective to the wavelengths of light in use, as well as to obtain additional spectral information that would not necessarily be obtained only by spectral transmission measurements (Office Action, page 8).

As presented in earlier communications, applicant agrees that none of the references of record teaches or suggests the invention as claimed in claim 1. But the factual record also teaches away from the combination of documents asserted in the Office Action, and there is no factual basis for the two positions taken to support the combination. The obviousness rejection should therefore be withdrawn.

Erickson's extensive disclosure is directed exclusively at transmittance measurements. Erickson's device employs collimation or modulation to select for on-axis light that penetrates through a turbid sample without being scattered, and his disclosure qualifies this selection of on-axis light as "necessary" to reduce the amount of light

received from neighboring light-emitting diodes (col.11, lines 36-41). There is no teaching that such an arrangement should be, or even could be, used in a reflectance mode where light could be conveyed to off-axis detectors by uneven body surfaces or through scattering. And Erickson teaches away from the use of his system in the context of analyte measurements by indicating that implantable sensors would likely be a preferable approach. One of ordinary skill in the art therefore would not be motivated to use Erickson's teachings in a reflectance mode in combination with the Malin and Kley disclosures.

The Office Action states that one of ordinary skill would make the combination to take advantage of time multiplexing of the acquisition of data to effectively reduce the amount of time required to obtain thousands of data points at multiple locations on a sample. But nowhere in Malin or Kley, or any other part of the factual record, is there any indication that thousands of data points are required for an analyte measurement. It is even unclear why one would ever need to quickly make thousands of measurements of an analyte such as glucose. This obviousness theory is not supported by any evidence of record or even any other type of reasoned explanation, such as why the combination would be a matter of common sense.

The Office Action also does not provide a factual basis of any kind for the asserted motivation to expand the range of uses for the apparatus, and this assertion is inconsistent with the teachings of the Erickson patent. Specifically, simply adding features to an apparatus is inconsistent with Erickson's teaching to make a device that is inexpensive and compact. And Erickson also teaches another way to perform the objectives of the Kley and Malin patents in a way that is likely to be more accurate and economical. Based on the evidence of record, therefore, one of ordinary skill in the art would not be motivated to combine the teachings of the Kley or Malin patents with the teachings of the Erickson patent.

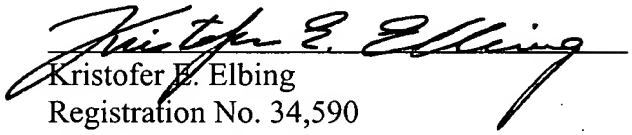
Claims 41 and 58 distinguish over the prior art of record for at least reasons similar to those advanced in support of claim 1. The remaining claims are dependent and should be allowable for at least the reason that they depend on an allowable claim.

Should further questions arise concerning this application, the Examiner is invited to call Applicants' representative at the number listed below. The Commissioner is hereby

authorized to charge any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0750.

Respectfully submitted,

October 15, 2007
Dated



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